

ABSTRACT

A bulk-doped semiconductor that is at least one of the following: a single crystal, an elongated and bulk-doped semiconductor that, at any point along its longitudinal axis, has a largest cross-sectional dimension less than 500 nanometers, and a free-standing and
5 bulk-doped semiconductor with at least one portion having a smallest width of less than 500 nanometers. Such a semiconductor may comprise an interior core comprising a first semiconductor; and an exterior shell comprising a different material than the first semiconductor. Such a semiconductor may be elongated and may have, at any point along a longitudinal section of such a semiconductor, a ratio of the length of the section to a
10 longest width is greater than 4:1, or greater than 10:1, or greater than 100:1, or even greater than 1000:1. At least one portion of such a semiconductor may have a smallest width of less than 200 nanometers, or less than 150 nanometers, or less than 100 nanometers, or less than 80 nanometers, or less than 70 nanometers, or less than 60 nanometers, or less than 40 nanometers, or less than 20 nanometers, or less than 10 nanometers, or even less
15 than 5 nanometers. Such a semiconductor may be a single crystal and may be free-standing. Such a semiconductor may be either lightly n-doped, heavily n-doped, lightly p-doped or heavily p-doped. Such a semiconductor may be doped during growth. Such a semiconductor may be part of a device, which may include any of a variety of devices and combinations thereof, and, and a variety of assembling techniques may be used to
20 fabricate devices from such a semiconductor. Two or more of such a semiconductors, including an array of such semiconductors, may be combined to form devices, for example, to form a crossed p-n junction of a device. Such devices at certain sizes may exhibit quantum confinement and other quantum phenomena, and the wavelength of light emitted from one or more of such semiconductors may be controlled by selecting a width
25 of such semiconductors. Such semiconductors and device made therefrom may be used for a variety of applications.

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